

THE SIMULIIDAE (DIPTERA) OF UTAH, PART I. KEYS, ORIGINAL CITATIONS, TYPES AND DISTRIBUTION

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The Simuliidae are small, inconspicuous insects, but many of them are vicious biters and are extremely annoying to man and other animals. They often attack with terrible severity and in some cases have occurred in such great numbers as to cause the death of their victims (Riley, 1887; Lugger, 1896; Millar and Rempel, 1944; Rempel and Arnason, 1947). Certain species of black flies are known to be vectors of important diseases of man and other animals, and other species are suspected of being of medical importance. As a result, black flies have attracted considerable attention in many parts of the world. In North America, north of Mexico, workers have largely confined their attention to certain regions of Alaska, north and eastern Canada, and the eastern United States. With an ever increasing interest in the black flies of North America and the general paucity of information on the western fauna, it seems worthwhile to present certain aspects of research recently conducted on the black flies of Utah.

Peterson (1955) briefly reviewed the literature directly concerned with the black-fly fauna of Utah. Since that time a number of additional papers on the biology and taxonomy of the simuliid fauna of the area have been published (Peterson, 1956, 1958, 1959a, 1959b, 1959c, 1960; Peterson and DeFoliart, 1960; DeFoliart and Peterson, 1960; Stone and Peterson, 1958; Stone and DeFoliart, 1959). In the present paper an attempt has been made to present workable keys to the females, males and pupae; provide information on type specimens, and list the general distribution of the species in Utah, as well as furnish additional knowledge on the general distribution of these species in western North America.

Current black-fly classification is in a state of flux with only a glimmer of universal agreement appearing on the horizon. This applies not only to the generic and subgeneric categories but, in a number of instances, to species as well. A number of species listed herein (indicated in the keys by an *) may eventually prove to be complexes of several species, and others originally described from the Palaearctic region may prove to be different than Nearctic species bearing the same names. No attempt is made, at this time, to solve such problems, but rather, to indicate the present status of the species under consideration. In this regard, this paper provides a starting point for future studies on the black flies of Utah.

At least nine undescribed simuliid species are known to occur in the state in addition to the 43 species listed in this study. Most of these are known only from one or more of the immature stages, or from an incomplete series of adult specimens. Descriptions of these

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latter species must wait until future collecting provides additional material for study.

KEYS TO THE GENERA OF NORTH AMERICAN SIMULIIDAE²

Adults

1. Scutum with stout, erect hairs but no fine recumbent hairs; antenna 9-segmented; a bulla behind eye laterally *Gymnopsis* Stone
Scutum usually with fine recumbent hairs but never stout, erect hairs; antenna with 9-11 segments; with or without a bulla behind eye laterally 2
2. Costa with fine hairs only, not interspersed with spinules; radial sector distinctly forked apically; with or without a bulla behind eye laterally 3
Costa usually with spinules interspersed among the fine hairs; radial sector simple (occasionally obscurely forked at extreme apical portion); no bulla behind eye 5
3. Vein R₁ joining costa at about middle of wing; fork of radial sector ending before termination of costa; m-cu fold apparently unforked; vein Cu₂ nearly straight *Parasimulium* Malloch
Vein R₁ joining costa well beyond middle of wing; fork of radial sector ending near termination of costa; m-cu fold forked apically; vein Cu₂ sinuous 4
4. Antenna 9-segmented; at least an indication of a bulla behind eye; ovipositor of female short, not reaching anal lobes; dististyle of male with a single apical spine *Twinnia* Stone and Jamnback
Antenna 10- or 11-segmented (9-segmented in *P. gibsoni*); no bulla behind eye; ovipositor of female usually extending to or beyond anal lobes; dististyle of male often with more than one apical spine *Prosimulium* Roubaud
5. Length of vein R not less than one-third the remaining distance to apex of wing, with hair dorsally; basal cell of wing usually distinguishable; second hind tarsal segment without pedisulcus or this represented by a shallow depression only *Cnephia* Enderlein
Length of vein R equal to much less than one-third the remaining distance to apex of wing, with or without hair dorsally; basal cell of wing absent; second hind tarsal segment with a distinct, usually deep pedisulcus *Simulium* Latreille

Pupae

1. Dorsum of abdomen without hooks; sternites 4-6 each with about ten hooks some of which occur in more than one transverse row; almost no cocoon *Gymnopsis*
Dorsum of abdomen with hooks on some of the segments; if sternites 4-6 have more than four hooks these are in a single transverse row; cocoon variable 2
2. Cocoon irregular, shapeless, without a well defined anterior margin; terminal abdominal segment with two large spines 3
Cocoon usually well developed, variously shaped, usually with a well defined anterior margin; terminal abdominal segment with two short spines or none 6
3. Tergites 6-8 without an anterior row of fine spine-like hooks *Twinnia*
Tergites 6-8, at least, each with an anterior row of fine spine-like hooks 4
4. Respiratory filaments arising from a rounded knob on a short petiole *Cnephia*

2. For a discussion of the general morphology used in the keys the reader is referred to the work of Stone and Jamnback (1955).

- Respiratory filaments not arising from a rounded knob on a short petiole 5
5. Respiratory filaments 12 or less, arising from two main trunks *Cnephia*
 Respiratory filaments if less than 12, not arising from two main trunks *Prosimulium*
6. Cocoon stalked, and anterior margin not well defined; or, if not so, lateral margins of terminal segment with short, curved, double or treble pronged, or single hooks *Cnephia*
 Cocoon not stalked, and anterior margin well defined; lateral margins of terminal segment without short, curved hooks although setae may be present *Simulium*

Larvae³

1. Larvae lacking cephalic fans; anal cross-piece Y-shaped 2
 Larvae with cephalic fans; anal cross-piece X-shaped 3
2. Labrum enlarged and densely hairy; mandible with small teeth on outer subapical margin *Gymnopaia*
 Labrum normal, not enlarged but densely hairy; mandible without small teeth on outer subapical margin *Twinmia*
3. Tips of secondary mouth fan (under primary fan) when expanded, forming a straight line; antenna with segments 1 and 2 colorless, segments 3 and 4 darkly pigmented; median tooth of submentum trifid; anal gill with three simple lobes *Prosimulium*
 Tips of secondary mouth fan, when expanded, forming an arc; antenna with segments 1 and 2 yellow to brown, segments 3 and 4 rarely dark brown; median tooth of submentum single; anal gill with three simple or compound lobes 4
4. Submentum with large and subequal outer and median teeth and three smaller subequal intermediate teeth on each side; anal gill with three compound lobes (except *S. (Eusimulium) aureum* and *S. (Neosimulium)* *Simulium*
 Submentum variable but not as above; anal gill with three simple lobes *Cnephia*

Keys to the Utah Species of *Prosimulium*

Females

1. Antenna 10-segmented *unicum*
 Antenna 11-segmented 2
2. Claws each with a strong, thumb-like, basal projection; frons narrow, nearly parallel sided *onychodactylum**
 Claws simple, frons broad, widening above 3
3. Integument orange *fulvum*
 Integument basically brown to black 4
4. Antenna entirely bright yellow; legs mostly yellow *flaviantennus*
 Antenna brown to black, at most with basal two segments yellow; legs variable 5
5. Arms of genital rod expanding distally into enlarged plates, each with a long, slender, medial projection; ovipositor flaps short, not reaching tips of anal lobes 6
 Arms of genital rod expanded into plates but these plates with at most, short, medial projections; ovipositor flaps longer, reaching or extending beyond tips of anal lobes 7
6. Genital rod short, arms short and narrow, expanding distally into enlarged, concave, triangular plates, the slender medial projections

3. This key can be safely used only for larvae having well developed white or darkened respiratory histoblasts.

- of the two plates often nearly touching; ovipositor flaps broadly rounded along entire outside margins, medial margins narrowly sclerotized; cercus twice as broad as long *daviesi*
- Genital rod long, arms long and narrow, widely divergent in the shape of a broad U, enlarged terminal plates quadrate, with inner distal margins produced medially as long, slender, curved projections; ovipositor flaps not broadly rounded along entire outside margins, medial margins broadly sclerotized; cercus only about one-fourth wider than long *shewelli*
7. Anal lobe extending posteriorly beyond cercus a distance about equal to the length of the cercus itself; ovipositor flaps extending nearly to tips of anal lobes; genital rod laterally compressed, long and sinuous, arms twisting so they appear flattened dorsoventrally, expanding into C-shaped plates; small species (about 2.5 mm.) *longilobum*
- Anal lobe shorter, at most, extending only a short distance beyond posterior margin of cercus; ovipositor flaps variably shorter; genital rod not laterally compressed, and arms not twisting; larger species (3.0 mm. or over) 8
8. Sides of thorax and abdomen distinctly ashy gray; clypeus strongly convex; ovipositor flaps and anal lobes short, the latter not projecting posteriorly and not approaching apex of the rounded cerci *travisi*
- Sides of thorax and abdomen not distinctly ashy gray, at most with faint gray tinge; clypeus flat, not strongly convex; ovipositor flaps and anal lobes usually closely approaching or extending slightly beyond apex of cerci 9
9. Outer margins of ovipositor flaps broadly rounded basally, flaps acutely rounded apically, reaching tips of anal lobes; genital rod long and slender, arms expanding into plates, each with a short, medial projection; scape and pedicel of antenna darker than other segments *uinta*
- Outer margins of ovipositor flaps not broadly rounded basally, flaps bluntly rounded apically, reaching or extending beyond tips of anal lobes; genital rod short, narrowly forked, terminal plates each with a sclerotized, triangular area; scape and pedicel of antenna concolorous or lighter than other segments *exigens**

Males⁴

1. Integument of thorax orange; apex of dististyle truncate *fulvum*
- Integument of thorax basically brown to black; apex of dististyle variable 2
2. Antenna entirely yellow; legs mostly pale yellow *flaviantennus*
- Antenna brown to black, legs darker 3
3. Apex of dististyle pointed, with two terminal spines; ventral plate broad, shallow, V-shaped; basal two segments of hind tarsi swollen, disproportionately broader than remaining segments *onychodactylum**
- Apex of dististyle rounded or truncate, with two or more terminal spines; ventral plate not as above; basal two segments of hind tarsi not disproportionately broader than remaining segments. 4
4. Ventral plate with a compressed, median keel; paramer with large, flattened, oblong or rounded, sclerotized plates apically, and a long, slender, sclerotized rod basally 5
- Ventral plate without a compressed, median keel; paramer not as above or absent 6
5. Ventral plate with a prominent, laterally compressed, oblong, median keel; paramer with a rounded, sclerotized plate; dististyle short, tapering distally, with 3-4 terminal spines *exigens**
- Ventral plate with a median, triangular keel that is less compressed

4. The males of *P. longilobum* and *P. unicum* are not known.

- laterally; paramer with an elongate, sclerotized plate; dististyle short and broad, width at base more than one-half the total length, rounded apically, with three terminal spines *uinta*
6. First abdominal segment with fringe of fine, brown hair; paramer a slender, sclerotized bar with a spine-like projection on its dorsal surface at about one-half its length, this bar enlarging plate-like where it attaches to basistyle *shewelli*
First abdominal segment with fringe of fine, yellow hair; paramer not as above 7
7. Median recurved lip of ventral plate narrow and sharply pointed; integument of thorax dark brownish-black; legs dark *travisi*
Median recurved lip of ventral plate broad and bluntly pointed; integument of thorax with an orange tinge; legs lighter yellowish-brown *daviesi*

Pupae⁵

1. Respiratory organ consisting of two stout clubs on a short petiole, from each of which arise 16-20 slender filaments *onychodactylum**
Respiratory organ not club-like, but consisting of a series of slender filaments 2
2. Respiratory filaments 26 or less 3
Respiratory filaments 80-110 or more, short and tuft-like *exigens**
3. Respiratory filaments 10-12, arising from three broadly separated trunks *shewelli*
Respiratory filaments 16 or more 4
4. Respiratory filaments 16 5
Respiratory filaments 20-26 7
5. Respiratory filaments closely clumped together; dorsum of head and thorax strongly rugose *travisi*
Respiratory filaments not closely clumped, more divergent; dorsum of head and thorax not strongly rugose 6
6. Pupa brown in color; terminal spines not set on strong convexities; abdominal sternite 4 with one or two small hooks on each side of posterior margin; medium in size (3.0-4.0 mm.) *daviesi*
Pupa more orange in color; terminal spines each set on a strong convexity; abdominal sternite 4 with one small hook on each side of posterior margin or none, often with small setae; larger in size (4.5-6.0 mm.) *fulvum*
7. Respiratory filaments 21-24 (av. 22) arising from three main groups; abdominal sternite 3 without hooks *uinta*
Respiratory filaments 20-26 (av. 25) arising from four or five main groups; abdominal sternite 3 with two hooks *flavian antennus*

Keys to the Utah Species of *Cnephia*

Females

1. Claws simple; calcipala large and broadly rounded; mesopleural membrane bare *mutata**
Claws each with a strong, thumb-like, basal projection; calcipala small; mesopleural membrane with a distinct patch of fine hair 2
2. Arms of genital rod widely separated, expanding into large, broad plates, each with a long, heavily sclerotized ridge on the anteroventral margin from which arises a large, blunt tooth; median space of buccopharyngeal apparatus broad, shallow, U-shaped; maxilla with about 32 retrorse teeth *jeanae*
Arms of genital rod more narrowly separated, expanding into long, narrow plates, each with a short, irregular, sclerotized ridge on the anteroventral margin from which arises a short, blunt, irregularly

5. The pupae of *P. longilobum* and *P. unicum* are not known.

shaped tooth; median space of buccopharyngeal apparatus narrow, deep, U-shaped; maxilla with 22-26 retrorse teeth *villosa*

Males

1. Mesopleural membrane bare; dististyle with two small, terminal spines *mutata**
- Mesopleural membrane with a distinct patch of fine hair; dististyle with a single, small, terminal spine 2
2. Scutum anteriorly with erect or, at least, semi-erect hair; trough-like lip of ventral plate short, narrow basally and sharply pointed apically; parameral teeth fine and somewhat indistinct *villosa*
- Scutum anteriorly with recumbent hair or, at most, with a few semi-erect hairs; trough-like lip of ventral plate longer, broader basally and more rounded apically; parameral teeth stout and distinct *jeanae*

Pupae

1. Respiratory organ reddish, consisting of four stout, appressed, finger-like, primary stalks, each of which is covered dorsally with numerous short, fine, pale filaments *villosa*
- Respiratory organ not so formed 2
2. Respiratory organ consisting of four moderately long, but often obscured, stalks that give rise to a series of smaller branches, each of which terminates in a number of slender, pale filaments, about 60-70 in all *jeanae*
- Respiratory organ with 12 filaments occurring on two main branches, a dorsal with 7 filaments and a ventral branch with 5 filaments *mutata**

Keys to the Utah Species of *Simulium*

Females

1. Vein R with hairs dorsally 2
- Vein R without hairs dorsally 8
2. Claws with a very small sub-basal tooth (visible only under high magnification); mandible and maxilla with fine hairs apically *baffinense*
- Claws each with a strong, thumb-like, basal projection; mandible serrate; maxilla with retrorse teeth 3
3. Postscutellum with a patch of appressed, yellow hair (may be rubbed off); basal two segments of antenna pale yellowish-brown; legs bicolorous *aureum**
- Postscutellum bare; antenna and legs more uniformly brown 4
4. Arm of genital rod with a conspicuous internal spine-like process *canonicolum*
- Arm of genital rod without a conspicuous internal spine-like process 5
5. Hair on stem vein yellow *bicornis*
- Hair on stem vein dark 6
6. General body vestiture silvery-white; frons narrow, parallel sided or only slightly divergent above; distance from tip of one arm of genital rod to tip of other arm equal to or only slightly greater than length of stem *wyomingensis*
- General body vestiture distinctly yellowish, frons narrow but sides distinctly divergent above; distance from tip of one arm of genital rod to tip of other arm considerably greater than length of stem 7
7. Legs brown, distal portion of each part darker; basitarsus of foreleg long and slender, 7-8 times as long as wide; large fly (3.0-3.5 mm.) *pugetense**
- Legs darker and uniformly brown; basitarsus of foreleg shorter and broader, 6 times as long as wide; smaller fly (2.0-3.0 mm.) *latipes**

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| 8. Claws simple | 9 |
| Claws with a large basal projection or a small sub-basal tooth | 20 |
| 9. Frons and terminal abdominal tergites shining black or brown | 10 |
| Frons and terminal abdominal tergites distinctly pollinose | 13 |
| 10. Fore coxa brown to black | 11 |
| Fore coxa yellow | 12 |
| 11. Anal lobe bluntly pointed ventrally, extending noticeably below cercus, not produced posteriorly | <i>petersoni</i> |
| Anal lobe quadrate, extending below cercus only a short distance, produced slightly under cercus | ? <i>jacumbae</i> |
| 12. Fore tibia with, at most, a narrow grayish-white streak on anterior surface covering not more than one-third the width of the tibia; small, dark fly (1.5-2.0 mm.) | <i>tuberosum</i> * |
| Fore tibia with conspicuous, bright yellowish-white patch on anterior surface covering at least one-half the width of the tibia; lighter brown color; variable in size but usually about 2.5-3.0 mm. | <i>venustum</i> * |
| 13. Mesonotum unstriped, or the stripes very narrow and some of them not straight | 14 |
| Mesonotum with one or more distinct, rather broad, straight stripes; if one, it may be rather diffuse and not reach scutellum | 17 |
| 14. Yellow to yellowish-gray species; thorax with almost no pattern; fore coxa yellow | <i>griseum</i> |
| Dark brown to black species; with or without a distinct black and light gray pattern on the thorax and abdomen; fore coxa variable | 15 |
| 15. Abdomen blackish posteriorly, with a thin but distinct gray pollinosity; fore coxa yellow | <i>decorum</i> |
| Abdomen with a very distinct black and light gray pattern; fore coxa gray pollinose | 16 |
| 16. Arms of genital rod each with a somewhat darkened external process, and a smaller and paler internal process that is removed from the one of the other side | <i>vittatum</i> * |
| Arms of genital rod without external processes, but each with a large, pale, internal process rather close to the one of the other side | <i>argus</i> |
| 17. Mesonotum with a single, rather broad, straight, orangish-brown stripe | 18 |
| Mesonotum with seven alternating stripes of contrasting color | 19 |
| 18. Ventral margin of anal lobe drawn out into a long, slender, digitate process; abdominal tergite 2 without a centrally placed black spot, but with dark spots on tergites 3-6; legs mostly yellow, especially mesothoracic legs | <i>venator</i> |
| Ventral margin of anal lobe projecting below cercus but is shorter, and broader; abdominal tergite 2 with a centrally placed black spot in addition to those on tergites 3-6; legs more conspicuously bicolored | <i>mediovittatum</i> |
| 19. Darker stripes on scutum orange; lateral dark spots on dorsum of abdomen absent or indistinct on most of the segments, never as prominent as the median dark sclerites; ventral projections of anal lobes not long enough to cross when in normal position | <i>bivittatum</i> |
| Darker stripes on scutum dark brown to blackish; dorsum of abdomen with pronounced, dark, lateral spots on several of the segments, nearly as dark as the median sclerites; ventral projections of anal lobes distinctly crossing each other when in normal position | <i>trivittatum</i> |
| 20. Claws each with a large, thumb-like, basal projection | 21 |
| Claws each with a small sub-basal tooth | 22 |
| 21. Frons and terminal abdominal tergites shining; fore coxa yellow | <i>rugglesi</i> |
| Frons and terminal abdominal tergites gray pollinose; fore coxa dark | <i>meridionale</i> |
| 22. Hair on stem vein pale | 23 |
| Hair on stem vein dark | 25 |

23. Fore coxa dark; terminal abdominal tergites with a thin, gray pollinosity *nigricoxum*
Fore coxa yellow; terminal abdominal tergites shining 24
24. Basal half of first flagellar segment of antenna yellow, distal half brown; legs mostly yellow, femora scarcely or not at all brown distally *defoliarti*
First flagellar segment of antenna entirely brown; legs yellow but femora extensively darker (common species) *arcticum*
(rare species) *corbis*
25. Fore coxa dark *piperi*
Fore coxa yellow 26
26. Frons grayish pollinose; scutum with two or seven stripes but never three; claws short, each with a small sub-basal tooth 27
Frons shining or sub-shining; scutum with three stripes, the median one straight and slender, the lateral ones curved and somewhat wider; claws long and slender, with a prominent sub-basal tooth *hunteri*
27. Ovipositor flaps short, their inner margins concave; hairs of anal lobe short and slender; scutum black with two submedian stripes *canadense*
Ovipositor flaps elongate, their inner margins subparallel; hairs of anal lobe long and stout; scutum with an orange tinge and seven stripes, although these are not always distinct *virgatum*

Males⁶

1. Vein R with hairs dorsally 2
Vein R without hairs dorsally 8
2. Postscutellum with a patch of appressed, yellow hair (may be rubbed off); legs bicolored; ventral plate with a laterally compressed, median keel, basal arms narrow, widely divergent *aureum**
Postscutellum bare; legs more uniformly brown; ventral plate without a laterally compressed, median keel 3
3. Dististyle tapering to a pointed apex 4
Dististyle obliquely angled apically, when viewed from end, showing a flattened, triangular area, one corner of this forming an inner lobe 5
4. Dististyle with a concavity on outside margin of apical one-half; ventral plate quadrate, shallowly concave on distal margin; hair on stem vein pale *canonicolum*
Dististyle without a concavity on outside apical margin; ventral plate broadly V-shaped when viewed from dorsal aspect; hair on stem vein dark *baffinense*
5. Ventral plate broad, with a medial V-shaped depression at the bottom of which is a prominent, hirsute, nipple-like ventral projection *pugetense**
Ventral plate broad but without a medial V-shaped depression or prominent, nipple-like, ventral projection 6
6. Posterolateral margins of ventral plate with 2 or 3 shallow, notch-like folds or wrinkles *bicornis*
Posterolateral margins of ventral plate smooth, without folds or wrinkles 7
7. Posterolateral margins of ventral plate rather truncate, the broad, hirsute central portion convexly triangular in shape and often projecting distally; dististyle viewed ventrally about twice as long as width at base; scutum with pale yellow hair on dorsal surface and a few silvery-white hairs on lateral margins *wyomingensis*
Posterolateral margins of ventral plate rounded, the hirsute central portion narrower and shallowly concave on distal margin, without a triangular convexity; dististyle viewed ventrally about 2.5 times as long as width at base; scutum with golden-yellow hair on dorsal surface and a few dark hairs on posterior margin *latipes**

6. The male of *S. nigricoxum* was not available for study and is not included in the key.

8. Dististyle short and stout with three or more apical spines 9
Dististyle longer, and/or with only one or two apical spines or none 10
9. Submedian white areas of scutum usually extending back as two distinct bands to the prescutellar white area; dististyle subquadrate, an obtuse rounded angle between the lateral and apical margins, apical spines small and set close together *argus*
Submedian pale areas of scutum fading out before reaching prescutellar area; dististyle subtriangular, the apicolateral margin a continuous curve, apical spines larger and set farther apart *vittatum**
10. The submedian white areas of scutum, visible in an anterior view, extending back to white prescutellar area *trivittatum*
The submedian white areas, if present, not reaching white or denuded prescutellar area although the dark lines of an anterior view may be white when viewed posteriorly 11
11. Dististyle flat, quadrangular, with a distal internal angle more or less prolonged toward the median line; dististyle shorter than basistyle 12
Dististyle more or less cylindrical or, if flattened, distinctly longer than wide; dististyle longer than basistyle 15
12. Median area of scutum broadly orange except for anterior part *venator*
Median area of scutum not orange 13
13. Thorax gray with a greenish tinge, without two anterior pollinose spots *griseum*
Thorax darker, brown to black, with two anterior pollinose spots 14
14. Apex of ventral plate pointed; prothoracic and mesothoracic legs with extensive darkened areas *mediovittatum*
Apex of ventral plate flattened or slightly rounded; prothoracic and mesothoracic legs yellow except for tarsi which are dark *bivittatum*
15. Dististyle with lateral angles which give a sinuous appearance, not more than three times as long as wide; ventral plate rather broad, with a strong, narrow, median projection which is nearly one-half as long as dististyle, posterior margin slightly concave on each side of the median projection *virgatum*
Dististyle with lateral margins more regular and/or ventral plate not so formed 16
16. Dististyle more than four times as long as wide, narrowed at basal third, without a basal process or pronounced angle; ventral plate semicircular in shape with a median notch *canadense*
Dististyle not more than three times as long as wide, not narrowed at basal third, if longer, then a basal process present; ventral plate of various shapes but not semicircular 17
17. Dististyle with a stout spine, sclerotized lobe, or distinct tubercle at base internally 18
Dististyle without a stout spine or distinct tubercle at base internally 23
18. Base of dististyle with a rounded lobe internally, bearing short spines or fine hairs 19
Base of dististyle with a stout spine or horny projection internally 21
19. Basal lobe of dististyle with a number of short, stout spines *tuberosum**
Basal lobe of dististyle with fine hairs only 20
20. Pleural tuft yellow; hind basitarsus about 5.3 times as long as greatest width; calcipala very small; apex of dististyle without a spine *petersoni*
Pleural tuft brown; hind basitarsus about four times as long as greatest width; calcipala well developed; apex of dististyle with a single, rather large spine *rugglesi*
21. Basal arms of ventral plate with short, lateral projections; apex of ventral plate hyaline, the sides set off by a notch, hairy *piperi*
Basal arms of ventral plate without lateral projections; if apex of ventral plate is smooth and pale it is long and narrow 22
22. Ventral plate with a prolonged hyaline tip; base of dististyle with a broad, flattened, sclerotized lobe internally *hunteri*

- Ventral plate conical, without a prolonged hyaline tip; base of dististyle with a large, posteriorly directed lobe internally *jacumbae*
23. Ventral plate broadly rounded, without denticles on margin *meridionale*
- Ventral plate more or less compressed laterally, with denticles on margin.. 24
24. Ventral plate narrow, in the shape of an inverted Y, with a ventral process or keel 25
- Ventral plate broader, tooth-shaped, without a ventral process or keel *venustum**
25. Ventral keel of ventral plate setose, forming an angle before apex of median portion of ventral plate *decorum*
- Ventral keel of ventral plate concave in profile, the angle being at the apex 26
26. Posteroventral angle of ventral plate forming a distinct bare projection beyond dentate portion; parameral hooks gradually lengthening toward the center *corbis*
- Posteroventral angle of ventral plate scarcely produced beyond dentate portion; parameral hooks consist of a few large ones intermingled with much smaller ones 27
27. Posteroventral angle of ventral plate pointed; base of keel ventrally with a short spine; legs with extensive darkened areas, especially on femora *arcticum*
- Posteroventral angle of ventral plate more truncate; base of keel ventrally without a spine; legs extensively yellow, femora without or with only scarcely darkened areas *defoliarti*

Pupae⁷

1. Respiratory organ consisting of a large, annulate club and two curved, basal projections, one dorsal and one ventral *canadense*
- Respiratory organ consisting of slender, branched or unbranched filaments 2
2. Anterdorsal margin of cocoon with one or two long, median projections 3
- Anterdorsal margin of cocoon without a long, median projection 6
3. Anterior margin of cocoon with two divergent projections; respiratory filaments 4 *bicornis*
- Anterior margin of cocoon with one median projection; number of respiratory filaments variable 4
4. Respiratory filaments 3 or 4 5
- Respiratory filaments 9-13 *piperi*
5. Respiratory filaments 3 *baffinense*
- Respiratory filaments 4 *latipes**
6. Front of Cocoon with a broad collar set at a distinct angle to the surface on which the cocoon is placed so that the cocoon is boot-shaped 7
- Front of cocoon with a narrow collar, raised little above the surface, or the anteroventral margins of the cocoon do not touch 11
7. Respiratory filaments 6 *petersoni*
- Respiratory filaments 8 or more 8
8. Respiratory filaments 8 *virgatum*
- Respiratory filaments more than 8 9
9. Respiratory filaments 10 *corbis*
- Respiratory filaments 12 10
10. Respiratory filaments evenly tapering from a swollen base, filaments spreading fan-like in a horizontal plane *defoliarti*
- Respiratory filaments narrow, spreading fan-like in a vertical plane *arcticum*
11. Respiratory filaments 4 12
- Respiratory filaments 6 or more 14
12. Dorsal respiratory filament strongly divergent at base from the

7. The pupae of *S. jacumbae*, *S. nigricoxum* and *S. venator* are not definitely known.

- other three; dorsal pair of filaments on a short petiole, the ventral pair with almost no petiole *aureum**
- Dorsal respiratory filament not strongly divergent from the other three, however, the dorsal pair of filaments may be slightly divergent from the ventral pair; filaments occur in two petiolate pairs 13
13. Dorsal pair of filaments usually slightly divergent from the ventral pair; ventral pair of filaments on a long petiole; head and thorax of pupa with fine granules; pupa small (2.0-3.0 mm.) *canonicolum*
- Dorsal and ventral pairs of filaments lying close together; both pairs occur on short petioles of about equal length; head and thorax of pupa with coarse granules; pupa larger (3.5-4.5 mm.) *pugetense**
14. Respiratory filaments 6 15
- Respiratory filaments more than 6 16
15. Respiratory filaments all arising rather close to base *tuberosum**
- *venustum**
- At least the median pair of filaments arising at a considerable distance from base *trivittatum*
16. Respiratory filaments 8 17
- Respiratory filaments more than 8 22
17. The dorsal filament widely diverging from the rest *wyomingensis*
- The dorsal filament not widely diverging from the rest 18
18. Cocoon tightly woven, with or without a thickened anterior rim; respiratory filaments in three main groups 19
- Cocoon, especially anteriorly, loosely woven; respiratory filaments in more than three groups 21
19. Thorax with conspicuous, long, forked or double trichomes; the three groups of filaments branching (2+1) + (2+1) + 2 (dorsal, medial, ventral), the dorsal group on short petioles, the medial and ventral groups on long petioles; anterior margin of cocoon with only a slightly thickened, narrow rim *mediovittatum*
- Thorax without trichomes, or with short, slender, inconspicuous trichomes; the three groups of filaments branching (2+1) + (1+2) + 2 (dorsal, medial, ventral); anterior margin of cocoon variable 20
20. Thorax without trichomes; filaments whitish, long and slender, the dorsal and medial groups on short petioles, the ventral group on a long petiole; anterior margin of cocoon with only a slightly thickened, narrow rim *griseum*
- Thorax with small trichomes; filaments shorter and thicker, branching fan-like near base of short petioles; anterior margin of cocoon broader and distinctly thickened *bivittatum*
21. Respiratory filaments thick, in three short-petiolate pairs, plus two singly *decorum*
- Respiratory filaments thin, in four petiolate pairs *rugglesi*
22. Respiratory filaments 10 *argus*
- Respiratory filaments more than 10 23
23. Respiratory filaments 14-16 *vittatum**
- Respiratory filaments more than 16 24
24. Respiratory filaments 22-26 *meridionale*
- Respiratory organ a dense tuft of 100 or more fine filaments *hunteri*

ORIGINAL CITATIONS, TYPES AND DISTRIBUTION

Twinnia nova (Dyar and Shannon)

Prosimulium novum Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):5-6, figs. 14-15 (female).

Cotypes.—Two females, Cat. No. 28325. U. S. National Museum.

Type locality.—Two Medicine Lake, Montana, July 4, 1921 (H. G. Dyar).

Distribution.—UTAH: Only one female with no data other than a "Utah" locality label was available for study from the state. However, no differences could be found in comparison with specimens examined from other western regions.

*Previous Records*⁸. British Columbia; California; Idaho; Montana; Washington.

Prosimulium (Helodon) onychodactylum Dyar and Shannon

Prosimulium onychodactylum Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):4, figs. 10-11 (female).

Holotype.—Female, Cat. No. 28324, U. S. National Museum.

Type locality.—Long's Peak, Colorado, timberline, elevation 11,000 feet, August 28 (T.D.A. Cockrell).

Distribution.—UTAH: 4,250 - 9,600 feet. Box Elder, Cache, Morgan, Salt Lake, Summit, Wasatch, and Washington Counties. NEW RECORDS: OREGON: Hood River Co., East Fork of Hood River, August 29, 1954 (R. K. Allen) (larvae); East Fork of Hood River at Sahalie Falls, August 31, 1958 (G. F. Edmunds and R. K. Allen) (larvae, pupae). WASHINGTON: Skamania Co., stream near Cultus Creek Forest Camp, Mt. Adams area, August 31, 1958 (G. F. Edmunds and R. K. Allen) (larvae). Yakima Co., American River at Lodgepole Forest Camp, September 5, 1958 (G. F. Edmunds and R. K. Allen) (larvae). PREVIOUS RECORDS: Alaska; British Columbia; California; Colorado; New Mexico; Wyoming; Yukon Territory.

Prosimulium (Prosimulium) daviesi Peterson and DeFoliart

Prosimulium daviesi Peterson and DeFoliart, 1960, Can. Ent. 92:85-91, figs. 1-12 (female, male, pupa, larva).

Holotype.—Female, U. S. National Museum.

Type locality.—Small stream 19.3 miles up Logan Canyon, Cache Co., Utah, elevation 6,200 feet, May 26, 1957 (B. V. Peterson).

Distribution.—UTAH: 6,200 - 10,050 feet. Cache, Duchesne, Morgan and Summit Counties. PREVIOUS RECORDS: Wyoming.

Prosimulium (Prosimulium) exigens Dyar and Shannon

Prosimulium exigens Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):10, figs. 3-4, 30-31 (female, male).

Cotypes.—Two males, Cat. No. 28329, U. S. National Museum.

Type locality.—Moscow, Idaho (J. M. Aldrich).

Distribution.—UTAH: 4,200 - 11,000 feet. Box Elder, Cache, Duchesne, Garfield, Grand, Iron, Juab, Kane, Millard, Morgan, Salt Lake, Sanpete, Summit, Wasatch, Washington and Weber Counties. NEW RECORDS: ARIZONA: Gila Co., Tonto Creek, Tonto National Forest, June 2, 1937 (C. M. Tarzwell) (larvae, pupae). Mohave Co., small stream about 10 miles west of Highway 91, and 5 miles south

8. These records include only those from western North America which is arbitrarily defined to include Alaska, Alberta, Arizona, British Columbia, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Yukon Territory.

of the Utah-Arizona border, March 17, 1956 (B. V. Peterson) (larvae). NEVADA: Douglas Co., Gardnerville, elevation 6,000, June 24, 1958 (D. M. Wood) (adults). Lincoln Co., 6 miles north Alamo, May 7, 1955 (B. V. Peterson) (larvae, pupae); 2 miles north Caliente, May 7, 1955 (B. V. Peterson) (larvae, pupae). PREVIOUS RECORDS: British Columbia; California; Colorado; Idaho; Montana; Oregon; Washington; Wyoming.

Prosimulium (Prosimulium) flaviantennus (Stains and Knowlton)

Simulium (Eusimulium) flaviantennus Stains and Knowlton, 1940, Ann. Ent. Soc. Amer. 33:79-80, figs. E, H (female).

Holotype.—Female, U. S. National Museum.

Type locality.—Logan Canyon, Cache Co., Utah, July 10, 1938 (D. E. Hardy and A. T. Hardy).

Distribution.—UTAH: 2,700 - 7,000 feet. Cache, Millard, Salt Lake. Summit, Wasatch and Washington Counties. NEW RECORDS: IDAHO: Lawyer's Canyon. MONTANA: Two Medicine River. PREVIOUS RECORDS: Colorado; Wyoming.

Prosimulium (Prosimulium) fulvum (Coquillett)

Simulium fulvum Coquillett, 1902, Proc. U. S. Nat. Mus. 25:96 (female, male).

Holotype.—Male, Cat. No. 6182, U. S. National Museum.

Type locality.—Bear Paw Mountains, Montana, September 3, 1891 (H. G. Hubbard).

Distribution.—UTAH: 6,000 - 10,050 feet. Cache and Duchesne Counties. PREVIOUS RECORDS: Alaska; British Columbia; California; Colorado; Idaho; Montana; Oregon; Washington; Wyoming; Yukon Territory.

Prosimulium (Prosimulium) longilobum Peterson and DeFoliart

Prosimulium longilobum Peterson and DeFoliart, 1960, Can. Ent. 92:100-102, figs. 32-34 (female).

Holotype.—Female, U. S. National Museum.

Type locality.—Mirror Lake, Duchesne Co., Utah, elevation 10,050 feet, July 26, 1952 (L. T. Nielsen).

Prosimulium (Prosimulium) shewelli Peterson and DeFoliart

Prosimulium shewelli Peterson and DeFoliart, 1960, Can. Ent. 92:96-100, figs. 22-31 (female, male, pupa, larva).

Holotype.—Female, U. S. National Museum.

Type locality.—Small stream crossing Highway 89-287, 7 miles north of Leeks Lodge, Teton Co., Wyoming, June 16, 1958 (G. R. DeFoliart).

Distribution.—UTAH: 8,800 feet. Wasatch Co. PREVIOUS RECORDS: Wyoming.

Prosimulium (Prosimulium) travisi Stone

Prosimulium travisi Stone, 1952, Proc. Ent. Soc. Wash. 54:76-77 (female, male, pupa).

Holotype.—Female, Cat. No. 61188, U. S. National Museum.

Type locality.—Anchorage, Alaska, September 30, 1948 (Sommerman and Dover).

Distribution.—UTAH: 10,050 feet. NEW RECORD: Duchesne Co., 3 miles northeast of Mirror Lake, June 27, 1958 (B. V. Peterson) (larvae, pupae with nearly mature adults). PREVIOUS RECORDS: Alaska; British Columbia; California; Colorado; Yukon Territory.

Prosimulium (Prosimulium) uinta Peterson and DeFoliart

Prosimulium uinta Peterson and DeFoliart, 1960, Can. Ent. 92:91-96. figs. 13-21 (female, male, pupa, larva).

Holotype.—Male, U. S. National Museum.

Type locality.—Sweeney Creek, Skyline Drive, mile 8.4, Pinedale, Sublette Co., Wyoming, June 26, 1957 (G. R. DeFoliart).

Distribution.—UTAH: 7,000 feet. Summit Co. PREVIOUS RECORDS: Wyoming.

Prosimulium (Prosimulium) unicum (Twinn)

Simulium (Prosimulium) unicum Twinn, 1938, Can. Ent. 70:49, figs. 1a, 1b (female).

Holotype.—Female, No. 4447, Canadian National Collection.

Type locality.—Morgan, Morgan Co., Utah, elevation 5,068 feet, May 6, 1937 (G. F. Knowlton).

Cnephia (Cnephia) jeanae DeFoliart and Peterson

Cnephia jeanae DeFoliart and Peterson, 1960, Ann. Ent. Soc. Amer. 53:218-219, figs. 15-25 (female, male, pupa, larva).

Holotype.—Male, U. S. National Museum.

Type locality.—Chalk Creek Canyon, Summit Co., Utah, elevation 7,000 feet, June 15, 1958 (B. V. Peterson).

Distribution.—UTAH: Summit Co. PREVIOUS RECORDS: Wyoming.

Cnephia (Cnephia) villosa DeFoliart and Peterson

Cnephia villosa DeFoliart and Peterson, 1960, Ann. Ent. Soc. Amer. 53:213-216, figs. 1-12 (female, male, pupa, larva).

Holotype.—Male, U. S. National Museum.

Type locality.—Sweeney Creek adjacent to Skyline Drive, 10 miles north of Pinedale, Sublette Co., Wyoming, elevation approximately 8,000 feet, June 26, 1957 (G. R. DeFoliart).

Distribution.—UTAH: 6,500 - 7,000 feet. Summit Co. PREVIOUS RECORDS: Wyoming.

Cnephia (Stegopterna) mutata (Malloch)

Prosimulium mutatum Malloch, 1914, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 26:20-21, fig. 18 (female).

Holotype.—Female, Cat. No. 15404, U. S. National Museum.

Type locality.—Glassboro, New Jersey, March 28, 1910 (C. T. Greene).

Distribution.—UTAH: 6,500 - 11,000 feet. Duchesne, Salt Lake, Summit and Utah Counties. PREVIOUS RECORDS: Alaska; British Columbia; California; Idaho; Montana; Washington; Wyoming.

Simulium (Eusimulium) aureum Fries

Simulia aurea Fries, 1824, Observationes Entomologicae 1:16 (male, female).

Cotypes.—(?) Two females, Zoological Institute, University of Lund, Lund, Sweden.

Type locality.—The types were collected by Zetterstedt in Scania, Sweden, from Esperöd and Björnstorp.

Distribution.—UTAH: 2,625 - 11,000 feet. Beaver, Box Elder, Cache, Carbon, Daggett, Davis, Duchesne, Garfield, Kane, Morgan, Piute, Salt Lake, Summit, Utah, Wasatch, Washington and Weber Counties. PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Colorado; Idaho; Nevada; Oregon; Washington; Wyoming; Yukon Territory.

Simulium (Eusimulium) baffinense Twinn

Simulium (Eusimulium) baffinense Twinn, 1936, Can. Jour. Res., D, 14:121-123, figs. 8A, 1-5 (female, male).

Holotype.—Female, No. 4126, Canadian National Collection.

Type locality.—Lake Harbour, Baffin Island, August 10, 1935 (W. J. Brown).

Distribution.—UTAH: 6,000 feet. Cache Co. PREVIOUS RECORDS: Alaska; Yukon Territory.

Simulium (Eusimulium) bicornis Dorogostajskij, Rubtsov and Vlasenko

Simulium bicornis Dorogostajskij, Rubtsov and Vlasenko, 1935, Zool. Inst., Acad. Sci., Mag. Parasitol. 5:178-180, figs. 1-8 (female, male, pupa, larva).

Holotype.—The sex of the type specimen is unknown to the writer; however, the type specimens are in the collection of the Museum of the Irkutsk Biologico-Geographical Scientific Research Institute, Irkutsk, U.S.S.R.

Type locality.—The following is a literal translation of the Russian from the original publication: "Rare form. Alone in two taiga (forest) streams; Mol'ke, Balag. river 10 V1 1931. larvae 10 examined, pupae 12 examined, ♂♂, 2 examined, ♀♀ - 3 examined, and in a spring beyond 3 railroad siding (Angara river near Pashkovo) 21 V111 1931 (pupae)."

Distribution.—UTAH: 5,500 - 7,000 feet. Salt Lake and Summit Counties. PREVIOUS RECORDS: Alaska.

Simulium (Eusimulium) canonicolum (Dyar and Shannon)

Eusimulium canonicolum Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):22, fig. 40 (female).

Holotype.—Female, Cat. No. 28337, U. S. National Museum.

Type locality.—Yellowstone Canyon, Wyoming, July 3, 1922 (H. G. Dyar).

Distribution.—UTAH: 4,679-10,050 feet. Cache, Salt Lake, Summit and Wasatch Counties. PREVIOUS RECORDS: British Columbia; California; Colorado; Idaho; Montana; Nevada; Oregon; Wyoming.

Simulium (Eusimulium) latipes (Meigen)

Atractocera latipes Meigen, 1804, Klassif. Beschr. Europäischen Zweiflügl. Insekten 1:96 (male).

Holotype.—Male (location not known to author).

Type locality.—Not known to author.

Distribution.—UTAH: 4,725 - 10,050 feet. Duchesne, Morgan, Salt Lake, Summit and Weber Counties. PREVIOUS RECORDS: Alaska; California; Wyoming; Yukon Territory.

Simulium (Eusimulium) pugetense (Dyar and Shannon)

Eusimulium pugetense Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):23, figs. 121-123 (male).

Holotype.—Male, Cat. No. 28338, U. S. National Museum.

Type locality.—Seattle, Washington (C. V. Piper).

Distribution.—UTAH: 5,000 - 9,936 feet. Cache, Morgan, Salt Lake, Summit and Weber Counties. PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Washington; Yukon Territory.

Simulium (Eusimulium) wyomingensis Stone and DeFoliart

Simulium (Eusimulium) wyomingensis Stone and DeFoliart, 1959, Ann. Ent. Soc. Amer. 52:395, 398-400, figs. 15-28 (female, male, pupa, larva).

Holotype.—Male, U. S. National Museum.

Type locality.—McGill Ranch irrigation ditch, Little Laramie River Valley, Albany Co., Wyoming, June 10, 1957 (G. R. DeFoliart).

Distribution.—UTAH: 5,675 - 7,000 feet. NEW RECORD: San Juan Co., Dry Wash, Coyote Gulch, July 26, 1957 (B. Quinn and R. Groosman) (pupae). Summit Co., Chalk Creek Canyon, June 2, 1956 (B. V. Peterson) (pupae, adults). PREVIOUS RECORDS: Wyoming.

Simulium (Byssodon) meridionale Riley

Simulium meridionale Riley, 1887. Rept. Ent. U. S. Dept. Agr. for 1886:513, fig. 6 (female).

Holotype.—Female, Cat. No. 773, U. S. National Museum.

Type locality.—Probably Lake View, Mississippi, March 16, 1886.

Distribution.—UTAH: 4,418 feet. Cache Co. PREVIOUS RECORDS: Alaska; Alberta; California; Colorado; Idaho; Montana; New Mexico.

Simulium (Byssodon) rugglesi Nicholson and Mickel

Simulium rugglesi Nicholson and Mickel, 1950. Univ. Minn. Agr. Expt. Station. Tech. Bull. 192:60-61, figs. 23A, B (female).

Holotype.—Female, University of Minnesota.

Type locality.—Todd County, Minnesota, June 24, 1937.

Distribution.—UTAH: 10,050 feet. Summit Co. PREVIOUS RECORDS: Alaska.

Simulium (Gnus) arcticum Malloch

Simulium arcticum Malloch, 1914, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 26:37, fig. 4 (female).

Holotype.—Female, Cat. No. 15410, U. S. National Museum.

Type locality.—Kaslo, British Columbia, July 4 (H. G. Dyar).

Distribution.—UTAH: 2,625 - 10,050 feet. Beaver, Box Elder, Cache, Daggett, Davis, Duchesne, Emery, Garfield, Iron, Juab, Kane, Millard, Morgan, Piute, Salt Lake, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, Washington, Wayne and Weber Counties. NEW RECORD: ARIZONA: Gila Co., Tonto Creek, Tonto National Forest, June 2, 1937 (C. M. Tarzwell) (larvae, pupae). PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Colorado; Idaho; Montana; Nevada; New Mexico; Oregon; Washington; Wyoming; Yukon Territory.

Simulium (Gnus) corbis Twinn

Simulium (Simulium) corbis Twinn, 1936, Can. Jour. Res., D, 14:147-148, figs. 15B, 1-5 (female, male, pupa).

Holotype.—Female, No. 4131, Canadian National Collection.

Type locality.—Blanch River, about five miles south of Perkins, Quebec, May 26, 1935 (C. R. Twinn).

Distribution.—UTAH: 4,302 - 6,289 feet. Cache, Davis, Grand Rich and Utah Counties. PREVIOUS RECORDS: Alaska, Alberta; British Columbia; Idaho; Yukon Territory.

Simulium (Gnus) defoliarti Stone and Peterson

Simulium defoliarti Stone and Peterson. 1958, Bull. Brooklyn Ent. Soc. 53:1-6, figs. 1-17 (female, male, pupa, larva).

Holotype.—Female, Cat. No. 63961, U. S. National Museum.

Type locality.—Smith's Fork Creek at Lander Trail, 8.5 miles from Smoot entrance, Lincoln Co., Wyoming, August 11, 1956 (G. R. DeFoliart).

Distribution.—UTAH: 4,500 - 8,730 feet. Cache and Salt Lake Counties. NEW RECORD: NEW MEXICO: Taos Co., Red River at west fork, Carson National Forest, July 27, 1937 (C. M. Tarzwell) (larvae, pupae). PREVIOUS RECORDS: British Columbia; California; Montana; Washington; Wyoming.

Simulium (Gnus) nigricoxum Stone

Simulium nigricoxum Stone, 1952, Proc. Ent. Soc. Wash. 54:94-95 (female).

Holotype.—Female, No. 1147, Canadian National Collection.

Type locality.—Hood River, Arctic Sound, Northwest Territories, August 28, 1915 (R. M. Anderson).

Distribution.—UTAH: 9,000 - 10,050 feet. Summit Co. PREVIOUS RECORDS: Alaska; Yukon Territory.

Simulium (Hearlea) canadense Hearle

Simulium virgatum canadensis Hearle, 1932, Proc. Ent. Soc. British Columbia 29:14-15 (female, male).

Holotype.—Male, No. 3454, Canadian National Collection.

Type locality.—Lanes Creek, Kamloops, British Columbia, August 6, 1931 (T. K. Moilliett and R. T. Turner).

Distribution.—UTAH: 4,302 - 10,050 feet. Cache, Davis, Juab, Kane, Morgan, Salt Lake, Summit, Wasatch, Washington, Wayne and Weber Counties. NEW RECORDS: ARIZONA: ? Gila Co., Middle Horton Creek, October 11, 1937 (C. M. Tarzwell) (larvae, pupae). Lower Horton Creek, October 12, 1937 (C. M. Tarzwell) (pupae). IDAHO: Idaho Co., Rapid River at junction with Little Salmon River, 5 miles north Pollock, September 6, 1958 (G. F. Edmunds and R. K. Allen) (larvae). WASHINGTON: Grays Harbour Co., tributary, East Fork Humptulips River, near Twinn Peak, September 2, 1958 (G. F. Edmunds and R. K. Allen) (larvae). Kitsap Co., Big Quilcene River on Highway 101, September 9, 1958 (G. F. Edmunds and R. K. Allen) (larvae, pupae). Okanogan Co., 10 miles east Tonasket, Highway 41, July 29, 1958 (G. F. Edmunds) (larvae, pupae). PREVIOUS RECORDS: British Columbia; California; Colorado; Montana; Nevada; New Mexico; Oregon; Wyoming.

Simulium (Hemicnetha) virgatum Coquillett

Simulium virgatum Coquillett, 1902, Proc. U. S. Nat. Mus. 25:97 (female, male).

Holotype.—Male, Cat. No. 6183, U. S. National Museum.

Type locality.—Las Vegas Hot Springs, New Mexico, August 4 (H. S. Barber).

Distribution.—UTAH: 2,750-5,000 feet. Garfield, Grand, Juab, Kane, San Juan, Tooele, Utah, and Washington Counties. NEW RECORDS: ARIZONA: Coconino Co., Oak Creek Canyon, July 2, 1958 (D. M. Wood) (larvae, pupae, adults). Gila Co., Tonto Creek, Tonto National Forest, June 2, 1937 (C. M. Tarzwell) (larvae, pupae). PREVIOUS RECORDS: California; New Mexico; Oregon; Washington.

Simulium (Neosimulium) argus Williston

Simulium argus Williston, 1893, North American Fauna 7:253-254 (female).

Holotype.—Female, University of Kansas.

Type locality.—Argus Mountains, California, May, 1891.

Distribution.—UTAH: 3,654-6,587 feet. Beaver, Cache, Davis, Juab, Kane, Salt Lake, San Juan, Summit, Uintah, Wasatch, and Washington Counties. NEW RECORDS: NEVADA: Lincoln Co., 2 miles north Caliente, May 7, 1955 (B. V. Peterson) (larvae, pupae); 6 miles north Alamo, May 7, 1955 (B. V. Peterson) (larvae, pupae, adults). OREGON: Grant Co., Dayville, June 16, 1958 (D. M. Wood) (adults). PREVIOUS RECORDS: Arizona; British Columbia; California; Idaho; New Mexico; Washington; Wyoming.

Simulium (Neosimulium) vittatum Zetterstedt

Simulia vittata Zetterstedt, 1838, Insecta Lapponica Descripta, page 803 (female).

Holotype.—A single female from Greenland, presumably the holotype, is in the Zetterstedt collection at the University of Lund, Lund, Sweden.

Type locality.—Greenland.

Distribution.—UTAH: 2,750-11,000 feet. Beaver, Box Elder, Cache, Carbon, Daggett, Davis, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Morgan, Piute, Rich, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Washington, Wayne and Weber Counties. PREVIOUS RECORDS: Alaska; Alberta; Arizona; British Columbia; California; Colorado; Idaho; Montana; Nevada; New Mexico; Oregon; Washington; Wyoming; Yukon Territory.

Simulium (Psilopelmia) bivittatum Malloch

Simulium bivittatum Malloch, 1914, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 26:31-32, fig. 7 (female).

Holotype.—Female, Cat. No. 15415, U. S. National Museum.

Type locality.—East Las Vegas, New Mexico, June 1, 1901 (T.D.A. Cockrell).

Distribution.—UTAH: 2,625-5,650 feet. Box Elder, Cache, Garfield, Kane, Morgan, Salt Lake, Summit, Wasatch, Washington, Wayne and Weber Counties. NEW RECORD: ARIZONA: Mohave Co., small stream along Highway 91 about 10 miles south Utah-Arizona border, March 18, 1956 (B. V. Peterson) (larvae, pupae, adults).

PREVIOUS RECORDS: Alberta; California; Colorado; Idaho; Montana; New Mexico; Washington; Wyoming.

Simulium (Psilopelmia) griseum Coquillett

Simulium griseum Coquillett, 1898, U. S. Dept. Agr., Div. Ent., N. S., Bull. 10:69 (female, male).

Holotype.—Male, Cat. No. 10381, U. S. National Museum.

Type locality.—Colorado (C. F. Baker)

Distribution.—UTAH: 2,625 - 7,750 feet. Daggett, Duchesne, Grand, San Juan, Wasatch, and Washington Counties. PREVIOUS RECORDS: Alberta; California; Colorado; Montana; New Mexico.

Simulium (Psilopelmia) mediovittatum Knab

Simulium mediovittatum Knab, 1916, Ins. Insc. Mens. 3:77-78 (female).

Holotype.—Female, Cat. No. 19635, U. S. National Museum.

Type locality.—Arlington, Texas, October 28, 1914 (F. C. Bishopp).

Distribution.—UTAH: 3,265 - 4,490 feet. Cache and Kane Counties.

Simulium (Psilopelmia) trivittatum Malloch

Simulium trivittatum Malloch, 1914, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 26:30 (female).

Holotype.—Female, Cat. No. 15408, U. S. National Museum.

Type locality.—Tampico, Mexico, December 17 (E. A. Schwarz).

Distribution.—UTAH: 5,418 - 6,000 feet. Grand, Wasatch, and Wayne Counties. NEW RECORD: MONTANA: Gallatin Co., West Yellowstone, June 8, 1956 (T. Morledge) (adults). PREVIOUS RECORDS: Arizona; California.

Simulium (Psilopelmia) venator Dyar and Shannon

Simulium venator Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69 (10):36, figs. 92-93 (female, male).

Holotype.—Female, Cat. No. 28343, U. S. National Museum.

Type locality.—Reno, Nevada, July 7, 1916 (H. G. Dyar).

Distribution.—UTAH: 4,270 - 4,500 feet. Cache, Morgan, and Washington Counties. PREVIOUS RECORDS: California; Idaho; Montana; Nevada; Oregon.

Simulium (Simulium) decorum Walker

Simulium decorum Walker, 1848, List Diptera British Museum 1:112 (female).

Holotype.—Female, British Museum, London. England.

Type locality.—St. Martin's Falls, Albany River, Ontario (G. Barnston).

Distribution.—UTAH: 8,730 - 10,050 feet. Salt Lake, Summit, and Wasatch Counties. NEW RECORDS: WASHINGTON: Jefferson Co., North Fork of Quinalt River at junction with Quinalt River, Olympic National Park, September 3, 1958 (G. F. Edmunds and R. K. Allen) (larvae). Pierce Co., Fort Lewis, June 25, 1957 (B. V. Peterson) (adults). PREVIOUS RECORDS: Alaska; Alberta; British Columbia; Colorado; Montana; Yukon Territory.

Simulium (Simulium) hunteri Malloch

Simulium hunteri Malloch, 1914, U. S. Dept. Agr., Bur. Ent., Tech. Ser. 26:59-60, fig. 3 (female).

Holotype.—Female, Cat. No. 15413. U. S. National Museum.

Type locality.—Virginia Dale, Colorado, September 30, 1912 (Bischoff).

Distribution.—UTAH: 4,679 - 10,050 feet. Cache, Duchesne, Salt Lake, Summit, and Wasatch Counties. NEW RECORDS: IDAHO: Shoshone Co., Wallace, September 3, 1949 (S. and D. Mulaik) (larvae, pupae, adults). WASHINGTON: Mason Co., Eldon, June 14, 1958 (D. M. Wood) (larvae, pupae). PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Colorado; Montana; New Mexico; Wyoming; Yukon Territory.

Simulium (Simulium) jacumbae Dyar and Shannon

Simulium jacumbae Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69 (10): 44-45, figs 113-114 (male).

Holotype. Male, Cat. No. 28348, U. S. National Museum.

Type locality. Jacumba Springs, California (E. A. McGregor).

Distribution.—UTAH: 2,625 - 10,050 feet. Summit and Washington Counties. PREVIOUS RECORDS: California; Colorado.

Simulium (Simulium) petersoni Stone and DeFoliart

Simulium (Simulium) petersoni Stone and DeFoliart, 1959, Ann. Ent. Soc. Amer. 52:394-395, figs. 1-14 (female, male, pupa, larva).

Holotype.—Male, U. S. National Museum.

Type locality.—School Creek - N. Sybille Creek confluence, Albany Co., Wyoming, June 18, 1956 (G. R. DeFoliart).

Distribution.—UTAH: 4,500 - 10,050 feet. Cache, Garfield, Iron, Morgan, Salt Lake, Summit, and Wasatch Counties. PREVIOUS RECORDS: California; Washington; Wyoming.

Simulium (Simulium) piperi Dyar and Shannon

Simulium piperi Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69(10):38-39, figs. 129-130 (male).

Holotype.—Male, Cat. No. 28344, U. S. National Museum.

Type locality.—Seattle, Washington (C. V. Piper).

Distribution.—UTAH: 2,750-9,936 feet. Beaver, Box Elder, Cache, Davis, Duchesne, Grand, Morgan, Piute, Salt Lake, San Juan, Sanpete, Summit, Wasatch, Washington, and Weber Counties. NEW RECORDS: ARIZONA: Gila Co., Upper Horton Creek, Apache National Forest, October 9, 1937 (C. M. Tarzwell) (larvae). PREVIOUS RECORDS: Alberta; British Columbia; California; Colorado; Idaho; Washington.

Simulium (Simulium) tuberosum (Lundström)

Melusina tuberosa Lundström, 1911, Acta. Soc. Fauna Flora Fenn. 34:14-15, fig. 10 (male).

Holotype.—Male (location not known to the author).

Type locality.—Probably Enontekis (Enontekiö), Finnish Lapland, Finland.

Distribution.—UTAH: 4,253 - 10,050 feet. Cache, Duchesne, Garfield, Juab, Morgan, Salt Lake, Sanpete, Summit, Wasatch, Washington, Wayne and Weber Counties. NEW RECORDS: ARIZONA: Cocino Co., Little Colorado River, June 29, 1937 (C. M. Tarzwell) (larvae, pupae). IDAHO: Custer Co., Big Lost River, Mackay, July 15, 1957 (G. F. Edmunds) (larvae). NEVADA: Douglas Co., Haines Creek, Allen) (larvae). NEW MEXICO: San Miguel Co., Gallinas River, Santa Fe National Forest, July 16, 1937 (C. M. Tarzwell) (larvae, pupae). WASHINGTON: Grays Harbor Co., Hump Tulips River at Hump Tulips, September 2, 1958 (G. F. Edmunds and R. K. Allen) (larvae, pupae). Kitsap Co., Big Quilcene River on Highway 101, September 4, 1958 (G. F. Edmunds and R. K. Allen) (larvae, pupae). PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Wyoming; Yukon Territory.

Simulium (Simulium) venustum Say

Simulium venustum Say, 1823. Jour. Acad. Natur. Sci. Philadelphia 3:28-29 (female, male).

Holotype.—Female, type probably lost.

Type locality.—Shippingsport, Ohio, collection date was between May 5 and June 9.

Distribution.—UTAH: 4,253 - 8,150 feet. Cache, Morgan, Salt Lake, Summit, Washington, and Weber Counties. PREVIOUS RECORDS: Alaska; Alberta; British Columbia; California; Colorado; Idaho; Montana; Washington; Wyoming; Yukon Territory.

ACKNOWLEDGEMENTS

I wish to express my thanks to the following specialists of the Family Simuliidae, for reading the manuscript and making valuable suggestions: Dr. A. Stone, Insect Identification and Parasite Introduction Research Branch, United States Department of Agriculture, Washington, D. C.; Mr. G. E. Shewell, Entomology Research Insti-

tute, Research Branch, Canada Department of Agriculture, Ottawa, Ontario; Dr. D. M. Davies and Mr. D. M. Wood, Department of Biology, McMaster University, Hamilton, Ontario; Dr. G. R. DeFoliart, Department of Entomology, University of Wisconsin, Madison Wisconsin. I am indebted to Dr. G. F. Edmunds, Jr. and Dr. R. K. Allen, Department of Zoology, University of Utah, Salt Lake City, Utah, for providing many specimens. To Dr. C. H. Lindroth, Zoological Institute, University of Lund, Lund, Sweden, and Dr. K. J. Heqvist, Department of Entomology, Swedish Museum of Natural History, Stockholm, Sweden, I am grateful for information on type specimens in the Zetterstedt and Fries collections respectively.

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